IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

KÄRMENIEMI Atty. Ref.: **2747-3**

Serial No. **10/578,861** Group: **3653**

Filed: **April 10, 2007** Examiner: **KUMAR**

For: **PARTICLE SEPARATING DEVICE**

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Commissioner for Patents
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Alexandria, VA 22313-1450

FACTUAL DECLARATION OF JUKKA TUUNANEN

Sir:

Pursuant to 37 CFR §1.132, the undersigned, **Jukka TUUNANEN**, hereby declares and states that:

1. I am a named coinventor of the invention disclosed and claimed in the above-identified US patent application which on information and belief has been rejected as being unpatentable over U.S. Patent No. 5,567,326 to Ekenburg et al (hereinafter "Ekenbrug et al").

2. I have conducted the following three electromagnetic field (EMF) simulations using Ansoft Maxwell® 2D SV simulation software to determine the flux properties for the pin arrangement of Ekenburg et al:

EMF Simulation 1: **Flat Magnetic Plate with Ferromagnetic Pins**

Pin arrangement per Fig. 8 of Ekenburg et al.

In the claim 8 Ekenberg describes that the pins are made from paramagnetic material. In the next claim the said paramagnetic material is stainless steel.

Although stainless steel is not a typical magnetic material there are magnetic stainless steels for special corrosive applications. Examples of these materials are Carpenter 430F and 430FR. Data of 430FR stainless steel is presented below.

Carpenter Stainless Type 430FR Solenoid Quality

Typical Direct Current Magnetic Properties
ASTM A341 method*

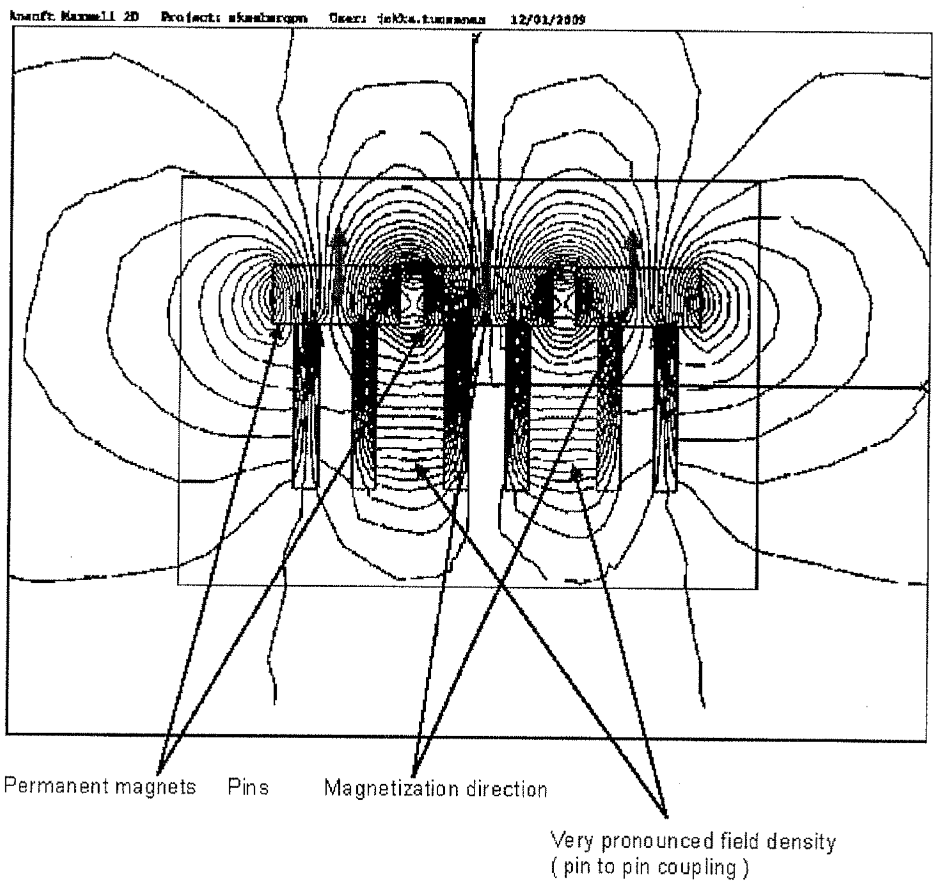
Condition	Rockwell B Hardness Mid-Radius	Maximum Relative Permeability	From 10,000 Gauss (1Tesla)			
			H_c(Oe)	H_c(A/m)	B_r(Gauss)	B_r(Tesla)
Unannealed	92 min	300/500	5.0/7.0	400/560	2000/6500	0.20/0.65
Mill Annealed CG	80/88	1100/2500	1.2/2.5	95/200	2500/8000	0.25/0.80
Mill Annealed PG	82/91	500/800	4.0/5.5	320/440	2500/8000	0.25/0.80
Full Anneal**	80/88	1100/2500	1.2/2.5	95/200	2500/8000	0.25/0.80

*ASTM A341 Method covers straight length DC magnetic testing of bars. Mill annealed bars 0.250/1.250" (6.35/32 mm) diameter generally exhibit higher permeability, lower H_c and Higher B_r values as the bar diameter decreases from 1.250" to 0.250" (32 to 6.35 mm) diameter (within the permeability H_c and B_r ranges shown). The variation in B_r is primarily a function of the test method rather than the material variability. Bars larger than 1.250" (32 mm) round are tested using machined ring specimens and ASTM A596 or ASTM A773.

**Dry hydrogen annealed at 1550°F (845°C) for 2 hours, then cooled nominally at 100°F (56°C) per hour to below 800°F (427°C).

Maximum relative permeability of 430FR stainless steel is 2500.

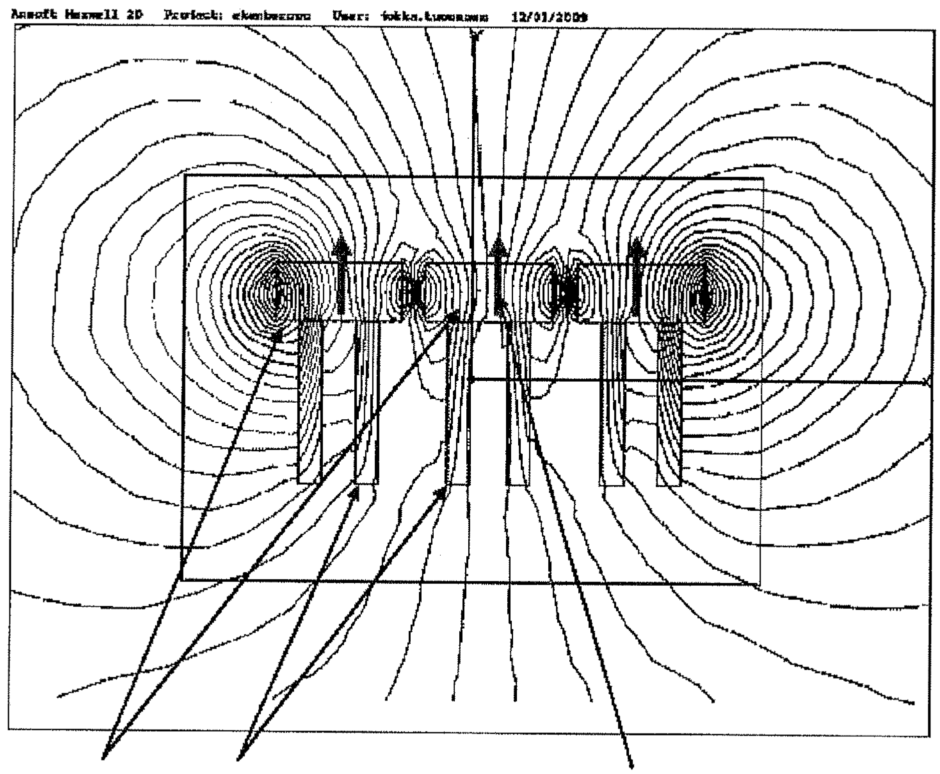
The following simulations are made by applying *iron* for the pin material. In Ansoft Maxwell simulation software the relative permeability of *iron* is 4000 and thus iron is considered superior pin material over magnetic stainless steel materials.



It can be seen from EMF Simulation 1 above that magnetic flux lines are leaking gradually along the pins. The residual fields near the edge of the pins are rather homogenous although outer pins are producing stronger but asymmetric magnetic fields.

EMF Simulation 2: **<u>Parallel Magnetized Permanent Magnet Disks with Ferromagnetic Pins</u>**

Pin arrangement per Fig. 8 of Ekenburg et al and description at column 9, lines 49-50.

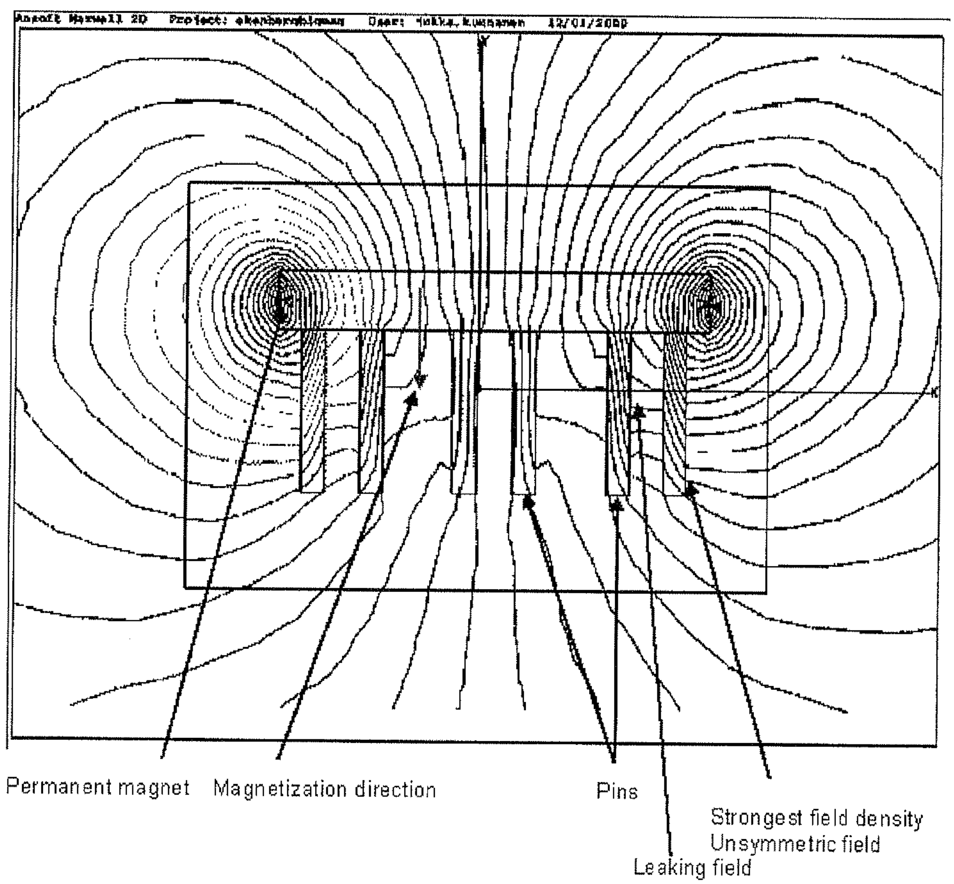


Permanent magnets Pins Field direction

This simulation shows that there is not much difference between one solid magnet block as employed for EMF Simulation 1 and the separate magnet disks employed for EMF Simulation 2. The outer magnets gain more but

the magnetic fields are still asymmetric. Flux lines are also leaking along the pins.

EMF Simulation 3: <u>Oppositely Magnetized Permanent Magnet Disks with Ferromagnetic Pins</u>



As is apparent from the EMF Simulation 3 above, the magnetic field of one magnet disk is strongly magnetically coupled with a neighbouring magnet disk. Field coupling continues between adjacent pins of the neighbouring

magnet disks with a strong misbalance of magnetic field density among the pins.

3. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully Submitted,

10th May, 2010
Date Signed

Jukka TUUNANEN